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SUBJECT: 2006 REVISIONS TO PROCEDURES FOR ESTIMATING VOLATILE ORGANIC COMPOUND EMISSIONS FROM PESTICIDES

Introduction

In 2002, the Department of Pesticide Regulation (DPR) initiated major revisions in pesticide volatile organic compound (VOC) emission calculation procedures. Several significant changes to DPR's VOC inventory have been implemented since that time. These include:

- more accurate identification of nonregulated adjuvant and technical product application records in the raw pesticide use report (PUR) data (Spurlock, 2002a)
- development of more representative formulation code-based default emission potentials (EPs), and more realistic default EPs for certain high-use product classes (Spurlock, 2002b)
- updates to nonattainment area boundary definitions to conform to the most recent one-hour ozone standard nonattainment area boundaries (Spurlock, 2004)
- inclusion of additional product formulation classes that contain agricultural products (Spurlock, 2005a)
- updated VOC outlier identification procedures that are more consistent with current PUR outlier procedures (Spurlock, 2005a)

Because of these modifications DPR's inventories now provide more accurate emission estimates than historical inventories calculated before 2002 (Spurlock, 2002c), and the updated procedures are more consistent with PUR error-handling procedures (Spurlock, 2005a).

The purpose of this memorandum is to document additional modifications planned for the upcoming 2006 update of the 1990–2004 annual pesticide VOC inventories. The target date for release of the 2006 update is Summer 2006. The modifications include:

- changes to the PUR application sites included and excluded from the VOC inventory

- development and refinement of criteria used to identify and exclude consumer products from the inventory
- development of default emission potentials for products containing sodium tetrathiocarbonate

In addition, this memorandum details two planned future changes. These are re-calculation and update of formulation code-based default EPs, and incorporation of application method adjustment factors in VOC emission calculations.

Pesticide use report application sites included in the volatile organic compound inventory

As outlined in the California State Implementation Plan, DPR's VOC program addresses emissions from agricultural and commercial structural pesticide applications. While there are 2171 distinct application sites in DPR's label database for which pesticides have been registered in California, there are only 302 application sites (i.e. commodities) used in DPR's PUR database. Historically, applications have been included or excluded from annual VOC inventory calculations based on whether the PUR-reported application site was considered agricultural or commercial structural. Most of these determinations were conducted early in the development of the VOC program without benefit of input from DPR's Enforcement Branch. Based on current Enforcement guidance, all site codes were recently re-evaluated as to whether they should be considered as commercial structural or agricultural applications according to definitions in the Food and Agriculture Code section 11408 and the California Code of Regulations section 3:6000.

Under the revised classifications of what constitutes "agricultural" or "commercial structural" use (vs. other types of uses such as institutional, industrial, or home), 11 application sites that were previously excluded from the VOC inventory will now be included (Appendix 1). In addition, three application sites are now excluded because they were determined to be neither agricultural use or commercial structural according to DPR's Enforcement Branch. The net effect of these changes on the inventory will be minor. Total 1990–2003 pesticide use for all products included in recent VOC inventories was 4.80×10^9 lbs (Spurlock, 2005b), whereas combined 1990–2003 of the 11 sites to be added was 12.9×10^6 pounds, or approximately 0.3% of the total use. The 1990–2003 reported use on the three sites that are now excluded was 27.6×10^3 pounds, or approximately 0.005% of the total use of VOC emitting pesticides.

Identifying products to be excluded from the inventory

In general, when a product is reported used on an agricultural or commercial structural site in the PUR, the presumption is that the product should be included in the VOC inventory. The exceptions to this rule are specific products that DPR has evaluated and determined to be home use, industrial, or institutional products. These evaluations are typically conducted as part of the re-evaluation process, or may occur during new product registration or annual review of products in the inventory. DPR will maintain a list of these excluded products, and uses this list to screen such products out of annual VOC inventories.

Home and garden products are the most common "excluded" products for which use is sometimes reported on agricultural sites in the PUR. Determinations on whether a product is a home and garden product only versus agricultural are made on a case by case basis. Generally, Home and garden product labels generally share several of the following characteristics:

- product name says "ready to use"
- does not contain personal protective equipment language
- contains the language "Homeowner use only"
- mixing directions are only given in small units (e.g. Tablespoon per gallon)
- specifies "residential" applications only
- specifies application rate directions in small units (e.g. square feet)
- does not list agricultural sites as permissible use sites

In addition, home and garden consumer products generally have very low PUR reported total use, and such products are regulated by the Air Resources Board.

Emission potential for pesticide products containing sodium tetrathiocarbonate

Pesticide products containing sodium tetrathiocarbonate are used as soil fumigants. The active ingredient is carbon disulfide, formed shortly after application from breakdown of the parent material sodium tetrathiocarbonate. Sodium tetrathiocarbonate products contain negligible amounts of other organic compounds. Therefore, assuming quantitative conversion of sodium tetrathiocarbonate (MW=186.3) to carbon disulfide (MW=76.14) following application, 1 gram of sodium tetrathiocarbonate applied yields (76.14/186.3)=0.4087 grams of carbon disulfide. The "carbon disulfide-equivalent" EP for products containing **X** mass fraction of sodium tetrathiocarbonate is then:

$$\textit{product EP} = 0.4087 * X$$

Updates of formulation code–based default emission potentials

DPR relies on default values to estimate product EPs for products with no thermogravimetric analysis (TGA) EP data. For most products, these default values are assigned as the median TGA-based EP of all products in that formulation class (Spurlock, 2002b). DPR recently initiated a recall of 787 liquid products to require TGA data for those products (DPR, 2005a), and began requiring submission of TGA data for product registrations (DPR, 2005b). Consequently DPR is anticipating continuous submissions of TGA data, and default EPs may be recalculated using all historical and new submitted TGA data.

Accounting for pesticide volatile organic compound emissions under field conditions

DPR's current method to estimate VOC emissions from pesticides relies on laboratory tests or other worst-case emission assumptions. DPR has not adjusted for emissions under field conditions because of the lack of data to make this adjustment. DPR proposes to change this policy and adjust the emission potential data for field conditions under certain situations. For example, if a registrant can demonstrate that VOC emissions for a specific product under field conditions are zero or negligible, DPR proposes to assign an adjustment to the emission potential, so that the inventory reflects zero emissions for the product. An example of a product with zero or negligible field emissions is one that is applied solely using tree injection methods.

While adjustments for other nonnegligible field emissions are possible, two types of data will generally be needed to make this adjustment. These are data that (1) accurately describe the reduction in total emissions due to application method and (2) allow DPR to determine which pesticide applications reported in the PUR are eligible for the adjustment, both currently and in previous years. This determination is especially critical for the 1990 base year because required emission reductions are expressed relative to the 1990 base year. Few, if any, pesticide products have complete data for even one of the two types. Research is in progress that would gather some, but not all of the needed information for a few pesticide products.

Data that measures or estimates total VOC emissions under current field conditions are needed. DPR has limited data for some active ingredients, primarily fumigants, but most of this data is incomplete. Only peak emissions, not total emissions were measured. Also, only the active ingredient emissions were measured. VOC emissions from inert ingredients and breakdown products must also be measured under field conditions. While fumigants are applied to bare soil, most other pesticides are applied to crops. Data on how VOC emissions vary with different crops may also be needed. Similarly, data may also be needed to determine how VOC emissions vary with different application methods and other factors.

Linking application method effects to PUR data will also be difficult. For example, if the reduction is due to an application method that is crop specific, that adjustment could be easily

integrated into the inventory because application site (i.e. crop) is reported for all pesticide applications. If, however, the adjusted emission potential is based on an application method that is not crop specific, survey data or some other means must be developed to link the adjusted emission potentials to both current and 1990 data.

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